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(54) Car body for railway rolling stock and method of fabricating car body.

(57) The present invention relates to a car body of a railway rolling stock in which the entire car body is divided into a plurality of blocks, which blocks are combined and connected.

In the past, a plurality of blocks constituting a vehicle body have draw-in materials in the periphery thereof. Accordingly, there arises a problem in that in the conventional body construction, the weight thereof increases, and time and labour required for fabrication increase. The present invention overcomes the problems by providing a body of a railway rolling stock comprising a roof construction (3) forming a roof of the body, side construction (2) forming both side walls of the body, an end construction forming an end surface in a longitudinal direction of the body, and an underframe (1) forming a lower surface of the body, wherein the roof construction (3), the side constructions (2) and at least one of the side constructions and the underframe (1) are connected through connecting members (4) in which a connected end (4b) is extended toward the roof construction (3), the side constructions (2) or the side constructions and the underframe (1) to be connected, the entirety being integrally formed by extruded shaped alloys and arranged to be drawn in a longitudinal direction of the body.

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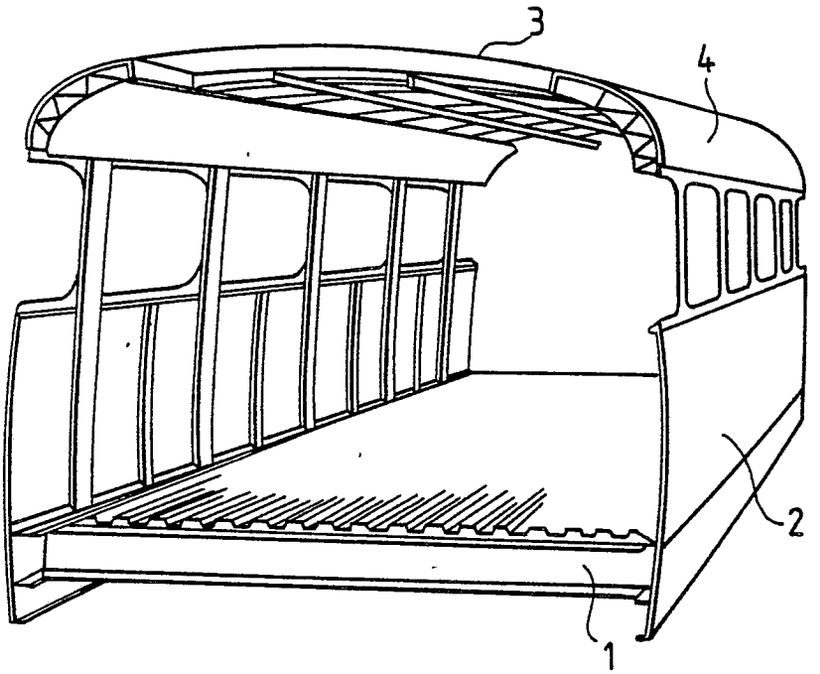
FIG. 1



CAR BODY YOR RAILWAY ROLLING STOCK AND METHOD OF FABRICATING CAR BODY

The present invention relates to a car body for a railway rolling stock in which the entire car body is divided into a plurality of blocks to fabricate them, and said plurality of blocks are combined.

Generally, a car body for a railway rolling stock is constituted by a combination of a side construction, a roof construction, an end construction and an underframe. The aforesaid side construction, the roof construction, the end construction and the underframe are separately assembled as blocks in advance. The aforesaid side construction, the roof construction, the end construction and the underframe are drawn into the respective outer peripheral portions, draw-in materials being combined to assemble them.

The car body for the railway rolling stock of this type is disclosed in Japanese Utility Model Publication No. 5983/1988.

In the above-described conventional body, it is designed so that the side construction, the roof construction, the end construction and the underframe are combined through the draw-in materials provided in the outer periphery thereof. The aforesaid draw-in materials require a rigidity to some extent to prevent the blocks from being deformed when the blocks are fabricated. Accordingly, as the draw-in materials, shaped alloys having a relatively thick wall thickness are used. In the connected portion between the blocks, the draw-in materials are superposed to each other, and therefore the weight of the entire body tends to increase. The aforesaid side construction, the roof construction, the end construction, and the underframe have the draw-in materials in the outer periphery thereof, and the number of members constituting the blocks tends to increase. With the recent trend of higher speed of the railway rolling stock, an increase of the weight of the body greatly influences on the tracks, and much labor is required for maintenance of the tracks. The increase of the car body weight also leads to an increase of consumption power.

In view of the above, there is a tendency to reduce the aforesaid draw-in materials in order to decrease the body weight, but in this case, the rigidity of the entire car body is possibly lowered. Moreover, since the rigidity of the blocks lowers, much labor is required for movement or assembly of the blocks.

It is therefore desirable to provide a lightweight vehicle body for a railway rolling stock.

It is further desirable to provide a car body for a railing rolling stock having a high rigidity.

It is also desirable to provide a car body for a railway rolling stock which reduces the numder of parts constituting a body to make fabrication thereof easy.

In the drawings:

FIG. 1 is a perspective view showing one embodiment of a vehicle body for a railway rolling stock according to the present invention ;

FIG. 2 is a sectional view widthwise of the car body shown in FIG. 1 ;

FIG. 3 is an enlarged sectional view of part "A" of FIG. 2 ;

FIG. 4 is a perspective view showing a connected portion with an end construction of an upper connecting member shown in FIG. 1 ;

FIG. 5 is a sectional view showing a further embodiment of an upper connecting member ;

FIG. 6 is a sectional view widthwise of the car body for a railway rolling stock provided with an upper connecting member having a different construction; and

FIG. 7 is a sectional view widthwise of the car body for a railway rolling stock provided with an upper connecting member and a lower connecting member which are different in construction.

One embodiment of the present invention will be described hereinafter with reference to FIGS. 1 to 4. Numeral 1 denotes an underframe forming a lower surface of the car body. The underframe 1 is composed of a side post 5, a cross beam 6 and a corrugated plate 7. The side post 5 is arranged so that the former is drawn in a longitudinal direction of the body at both positions widthwise of the car body of the underframe. The cross beam 6 is arranged widthwise of the car body between the aforesaid two side posts. The corrugated plate 7 is arranged on the upper surface of the cross beam so as to cover the upper surface of the underframe. Numeral 2 denotes a side construction forming both sides of the car body. The side construction 2 is composed of a side plate 8, a side post 9 and a belt rail 12. The side post 9 is arranged in a vertical direction, and the belt rail 12 is arranged perpendicularly to the side post 9. The side outer plate 8 is mounted on the outer surface of the side post 9 and the belt rail 12. It is noted that the side post 9 and the belt rail 12 have a construction to support a window unit 13. A reinforcing material is sometimes provided on the back of the side outer plate 8 parallel with the belt rail 12. Numeral 3 denotes a roof construction forming a roof portion of the car body. The roof construction 3 is composed of a roof outer plate 10 and a carline 11. The carline 11 is arranged widthwise of the car body, and the roof outer plate 10 is mounted on the outer surface of the carline 11. Numeral 4 denotes an upper connecting member for connect-

ing the side construction 2 and the roof construction 3. The upper connecting member 4 has a closed sectional shape and is formed from extruded shaped alloy made of light alloy, namely, aluminum. The upper connecting member 4 is drawn in a longitudinal direction of the car body. The upper connecting member 4 is composed of a lower connecting end 4a whose lower end is extended toward the side construction and an upper connecting end 4 whose upper end is extended toward the roof construction. The lower connecting end 4a is formed so as to register with the upper side of a window opening portion. The lower connecting end 4a is formed so that the outer surface thereof constitutes a surface continuous to the surface of the side outer plate 8 of the side construction. For example, in the case where the outer surface of the side construction is a curved surface, the outer surface of the lower connecting end 4a constitutes a curved surface continuous to the outer surface of the side construction. On the other hand, the upper connecting end 4b is formed so that the outer surface thereof constitutes a surface continuous to the roof outer plate 10 of the roof construction. An outer surface 4f of the upper connecting member 4 is formed to be arc so as to smoothly connect the outer surfaces of the lower connecting end 4a and the upper connecting end 4b. An inner surface 4g of the upper connecting member 4 is also formed to be arc likewise the outer surface 4f. The lower connecting end 4a of the upper connecting member 4 is formed with a projection 4d formed to be projected toward the side construction. The projection 4d is provided to connect the side construction and the upper connecting member 4. The upper connecting end 4b of the upper connecting member 4 is formed with a projection 4c formed to be projected toward teh roof construction. The projection 4e is provided to connect the roof construction and the upper connecting member 4.

Since it is designed so that as described above, the lower connecting end 4a of the upper connecting member 4 is registered with the upper edge of the window opening portion, the structure of the side construction 2 is a portion in which the side post 5 of the underframe 1 is connected to the lower connecting end 4a of the upper connecting member 4 from the upper portion. Accordingly, in constructing the side construction 2, the upper connecting portion 2 is connected to the upper end of the side construction 2 to improve the rigididy of the side construction 2 itself. By improving the rigidity of the side construction 2 in a manner as described above, work done in conecting with other blocks becomes extremely simple.

The internal construction of the upper connecting member 4 is that a hollow portion 4c partitioned by a partitioning wall 4h is formed between an outer wall and an inner wall.

Numeral 14 denotes an end construction forming an end in a longitudinal direction of the body. The end construction 14 is constituted by combining and connecting a vertical rib member and a horizontal rib member and connecting an outer plate to the outer surfaces thereof. Numeral 15 denotes an end receiving member in which an end in a direction of the body of the upper connecting member 4 is fitted. The end receiving member 15 has a sectional shape which can be fitted into the upper connecting member 4. The end receiving member 15 is positioned above the both sides widthwise of the end construction 14.

Assembling of the entire body constructed as described above will be explained hereinafter. The underframe 1 is constructed such that first, a plurality of side posts 5 are arranged parallel to each other in a predetermined spaced relation, a plurality of cross beams 6 are arranged between the side posts 5, and these are connected, after which the corrugated plate 7 is connected. The side construction 2 is constructed such that first, the side post 9 and the belt rail 12 are combined straight, the upper connecting member 4 is arranged on the upper end of the side post 9, which are connected, and the side outer plate 8 is connected to the outer surfaces of the side post 9 and the belt rail 12. The upper side of the side outer plate 8 is connected to the projection 4d of the upper connecting member 4. The roof construction 3 is constructed such that the carline 11 is connected to the member arraged in a longitudinal direction of the body, after which the roof outer plate 10 is connected. The end construction 14 is constructed such that the vertical and horizontal members are combined, after which the outer plate is connected thereto, and the end receiving member 15 is provided upwardly on both sides widthwise of the body. In this manner, blocks are constituted and then combined and connected. First, on the upper surface on both sides widthwise of the body, the side construction 2 is arranged at right angle to the upper surface of the underframe, which are connected. The roof construction 3 is arranged and connected between the upper connecting members 4 of the side construction arranged on both sides widthwise of the body. The carline 11 of the roof construction 3 is placed on the projection 4e of the upper connecting member 4 and connected. After the underframe 1, the side construction 2 and the roof construction 3 have been assembled in the manner as described above, the end construction 14 is mounted on the end in a longitudinal direction of the body of the first-mentioned elements. At this time, the end of the upper connecting member 4 of the side construction 2 and the end receiving member 15 of the

end construction 14 are fitted each other.

With the arrangement as described, the upper connecting member 4 is formed so that the entirety assumes a closed section, and therefore, the member itself is high in rigidity. Accordingly, since the side construction 2 and the roof construction 3 are connected through the upper connecting member 4, the rigidity of the connected portion can be improved. This is advantageous in improving the rigidity of the entire car body. Since the upper connecting member 4 is made of light alloy, the member itself can be reduced in weight, which can be reduced in weight as compared with the conventional construction in which draw-in materials are superposed. Furthermore, since the lower end of the upper connecting member 4 is formed up to the upper side of the window opening portion of the side construction 2, the number of parts constituting the side construction 2 can be reduced.

While the entirety of the upper connecting member 4 may be constituted integrally, it is to be noted that generally, extruded shaped alloys made of light alloy which are divided into plural members are combined and connected. It is advantageous to make holes in the plurality of extruded shaped alloys made of light alloy in terms of reduction in weight. Further, a flat plate may be bended to constitute an upper connecting member but much time and labor are required during the fabrication.

Next, the upper connecting member 4 has the inner surface 4g formed into an arc surface, and therefore the stress concentration can be prevented to improve the strength. When the railway rolling stock runs at high speeds within the tunnel, a phenomenon occurs in which pressure outside the vehicle rapidly varies. Even such a variation of pressure outside the vehicle occurs, a pressure resisting constrution is secured because the inner surface 4g of the upper connecting member 4 is formed into an arc surface.

Since the upper connecting member 4 has a downwardly extending lower connecting end 4a, the draw-in material such as a window head and the vertical rib member heretofore used for the side construction need not be used. Since the upper connecting member 4 further has a horizontally extending upper connecting end 4b, the draw-in materials heretofore used for the roof construction can be reduced. By the use of the upper connecting member 4 as described above, it is possible to reduce the number of parts constituting the side construction and the roof construction. Moreover, time and labor required to fabricate the side construction and the roof construction can be reduced.

Since the upper connecting member 4 is formed at the connected end with the projections 4d and 4e, positioning when the side construction and the roof construction are connected can be easily accomplished. Accordingly, the fabrication of the body is easily accomplished. The side construction and the roof construction are connected through the upper connecting member 4, whereby the connected position of the members is deviated from a corner in section widthwise of the body at which stress concentration is liable to occur. Accordingly, the reliability of the connected portion of the members can be improved. Particularly, it is advantageous in the case where connection of the members is done by welding.

Next, after the upper connecting member 4 has been incorporated into the side construction 2, the underframe 1 and the roof construction 3 are connected. Thereby, the rigidity of the side construction 2 is improved by incorporation of the upper connecting member. Accordingly, transportation and positioning work of the side construction 2 become easy, and work can be done promptly.

In the following, a further embodiment of the present invention will be described with reference to FIGS. 5 to 7.

FIG. 5 shows another embodiment of an upper connecting member. Numeral 24 denotes an upper connecting member in which an internal partitioning wall 24h is formed into a truss. Other constructions of the upper connecting member 24 are similar to those of the aforementioned upper connecting member 4.

By forming the partitioning wall 24h into a truss as described above, the rigidity of the upper connecting member 24 can be improved more than the aforementioned upper connecting member 4.

FIG. 5 shows a still another embodiment of an upper connecting member. In FIG. 6, the same reference numerals as those used in the previous embodiment indicate the same elements. Numeral 34 denotes an upper connecting member in which an upper surface 34a and a side surface 34b are connected at an angle above 90°. The upper surface 34a forms a surface continuous to the surface of the roof outer plate 10, and the side surface 34b forms a surface continuous to the surface of the side construction 2. An inner surface 34c of the upper connecting member 34 is formed into an arc.

The side construction 2 and the roof construction 3 are connected through the upper connecting member 34 whereby the vertical length of the side of the body can be increased. The section modulus of the entire car body with respect to the vertical load can be improved. Accordingly, the rigidity of the body can be improved.

FIG. 7 shows a section widthwise of the body provided with the upper connecting member and the lower connecting member shown in FIG. 6. In FIG. 7, the same reference numerals as those used in the previous embodiments indicate the same

members. Numeral 15 denotes a lower connecting member arranged to be drawn in a longitudinal direction of the body at a position on both sides widthwise of the body of the underframe. An upper connected end 15a of the lower connecting member 15 is integrally constructed while extending to a position of the lower side of the window opening portion. A lower connected end 15b of the lower connecting member 15 is integrally constructed while extending toward a central portion widthwise of the body of the underframe. Numeral 6a denotes a cross beam which is shorter than the cross beam of the underframe shown in FIG. 1. Numeral 9a denotes a side post vertically arranged between the upper connecting member 34 and the lower connecting member 15, the side post having a length corresponding to the window opening portion.

Fabrication of the body constructed as described above will be explained. First, two upper connecting members 34 are arranged parallel to each other with the upper surfaces thereof directed downwardly, and the roof outer plate 10 and the carline 11 are arranged between the upper connecting members 34 and these members are connected. The thus constructed upper construction members are inverted after the connecting work has been terminated. On the other hand, two lower connecting members 15 are arranged parallel to each other, and the cross beam 6a is arranged between the lower connecting members 15, which are connected. The corrugated plate 7 is mounted on the cross beam 6a. Above the thus constructed lower construction member, the upper construction members are located in a predetermined spaced relation. The spacing between the upper construction member and the lower construction member is maintained so that the spacing between the lower connected end of the upper connecting member 34 and the upper connected end 15a of the lower connecting member 15 corresponds to the vertical dimension of the window opening portion. In such a state, the side post 9a is arranged between the lower connected end of the upper connecting member 34 and the upper connected end 15a of the lower connecting member 15, the upper end of the side post 9a is connected to the lower connected end of the upper connecting member 34, and the lower end of the side post 9a is connected to the upper connected end 15a of the lower connecting member 15.

With the arrangement as described above, the greater part of the side construction except the side post 9a can be integrally constructed by the upper connecting member 34 and the lower connecting member 15, and therefore the body is easily fabricated. Since the upper connecting member 34 and the lower connecting member 15 can be respectively fabricated independently, the fabrication is easier than the case where the conventional side construction is constructed. In the upper construction member and the lower construction member, large shaped alloys are arranged on both widthwise sides, the rigidity thereof is high and transportation and positioning are easy. Work when the body is assembled can be efficiently carried out.

As described above, according to the present invention, a body of a light-weight railway rolling stock can be provided.

Furthermore, a body of a railway rolling stock which is lihgt in weight and high in rigidity can be provided.

Moreover, a body of a railway rolling stock which can reduce the number of parts constituting the body and which is easily fabricated can be provided.

Claims

1. A car body for a railway rolling stock comprising a roof construction forming a roof of the body, side constructions forming both side walls of the body, an end construction forming an end surface in a longitudinal direction of the body, and an underframe forming a lower surface of the body, characterized in that said roof construction, said side constructions and at least one of said side construction and said underframe are connected through connecting members in which a connected end is extended toward the roof construction, the side constructions or the side constructions and the underframe to be connected, the entirety being integrally formed by extruded shaped alloys and arranged to be drawn in a longitudinal direction of the body.

2. A car body for a railway rolling stock according to claim 1, wherein said roof construction and said side constructions are connected through the upper connecting members in which a lower connected end is extended toward said side construction and an upper connected end is extended toward said roof construction, said side constructions being connected at a position of the upper surface of the side beam of the underframe.

3. A car body for a railway rolling stock according to claim 2, wherein said upper connecting member is formed of light alloy, and a partitioning wall is provided between an outer wall and an inner wall to form a hollow portion.

4. A car body for a railway rolling stock according to claim 3, wherein said upper connecting member has an outer surface which is a surface

continuous to the outer surfaces of said roof construction and said side constructions, and has an inner surface which is a smooth arc surface.

5. A car body for a railway rolling stock according to claim 4, wherein the surface of said upper connecting member is that a surface continuous to said roof construction and a surface continuous to said side constructions are connected by an arc surface.

6. A car body for a railway rolling stock according to claim 4, wherein the surface of said upper connecting member is that a surface continuous to said roof construction and a surface continuous to said side constructions are connected at an angle over 90°.

7. A car body for a railway rolling stock according to claim 3, wherein said upper connecting member is formed by extending its lower connected end to a position of an upper side of a window opening portion.

8. A car body for a railway rolling stock according to claim 3, wherein said upper connecting member has a projection connected to the roof construction in the roof construction connected portion and a projection connected to the side construction in the side construction connected portion.

9. A car body for a railway rolling stock according to claim 1, wherein said roof construction and said side constructions are connected through the upper connecting members in which the lower connected end is extended toward said side connections and the upper connected portion is extended toward said roof construction; and said side constructions and said underframe are connected through the lower connecting members in which the upper connected end is extended toward said side constructions and the lower connected end is extended toward the underframe.

10. A car body for a railway rolling stock according to claim 9, wherein said upper connecting member and said lower connecting member are formed of light alloy, and a partitioning wall is provided between an outer wall and an inner wall to form a hollow portion.

11. A car body for a railway rolling stock according to claim 10, wherein said upper connecting member has an outer surface which is a surface continuous to the outer surfaces of said roof construction and said side constructions and an inner surface which is an arc surface; and said lower connecting member has an outer surface which is a surface continous to the outer surfaces of said side constructions and said underframe and an inner surface which is an arc surface.

12. A car body for a railway rolling stock according to claim 11, wherein the surface of said upper connecting member is that the surface continuous to said roof construction and the surface continuous to said side construction are connected by an arc surface.

13. A car body for a railway rolling stock according to claim 11, wherein the surface of said upper connecting member is that a surface continuous to said roof construction and a surface continuous to said side constructions are connected at an angle over 90°.

14. A car body for a railway rolling stock according to claim 11, wherein the surface of said upper connecting member is that a surface continuous to said roof construction and a surface continuous to said side constrcutions are connected at an angle over 90°, and the surface of said lower connecting member is that a surface continuous to said side constructions and a surface continuous to said underframe are connected at an angle over 90°.

15. A car body for a railway rolling stock according to claim 10, wherein said lower connecting member is formed by extending the upper connected end to a position of a belt rail of the side construction.

16. A car body for a railway rolling stock according to claim 10, wherein said upper connecting member is formed by extending the lower connected end to a position of an upper side of a window opening portion, and said lower connecting member is formed by extending the upper connected end to a position of a belt rail of the side construction.

17. A method of farbricating a car body for a railway rolling stock in which an underframe, side constructions,a roof construction,and an end construction are separately constructed and combined, comprising incorporating upper connecting members into upper sides of said side construction to constitute the latter, and thereafter connecting the underframe, the roof construction and the end construction.

18. A method of fabricating a car body for a railway rolling stock in which blocks constituting a body are separately constructed, said blocks being combined to fabricate the body, comprising arranging and connecting a roof outer plate and a rib member between two upper connecting members arranged parallel to each other in a spaced relation adjusted to the width of the body to constitute an upper construction member of the body, arranging and connecting a cross beam between two lower connecting members arranged parallel to each other in a spaced relation adjusted to the width of the body to constitute a lower construction member of the body, holding the upper construction member of the body above the lower construction member of the body leaving a spacing corresponding to a vertical dimension of a window opening portion,

and connecting the opposed upper connecting members and lower connecting members throuh side posts.

FIG. 1

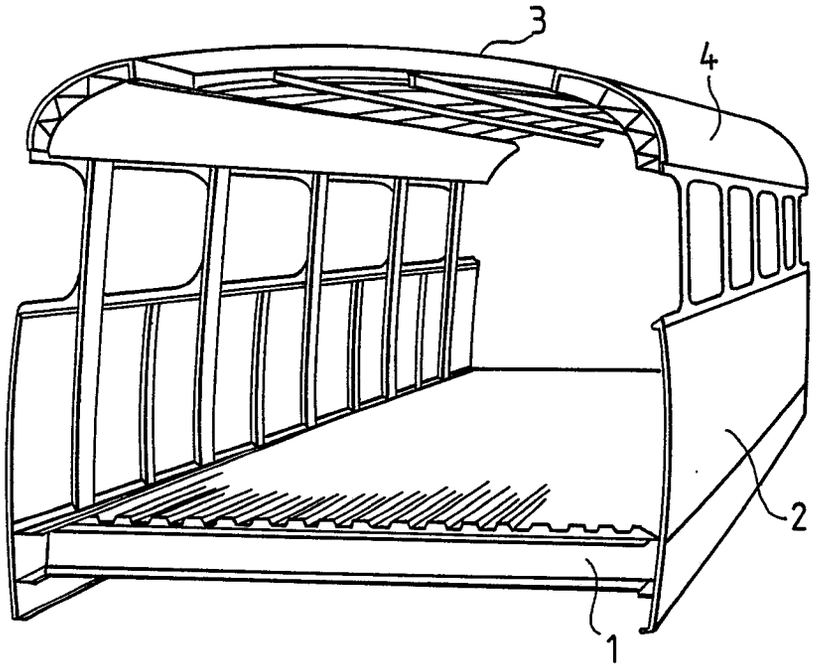


FIG. 2

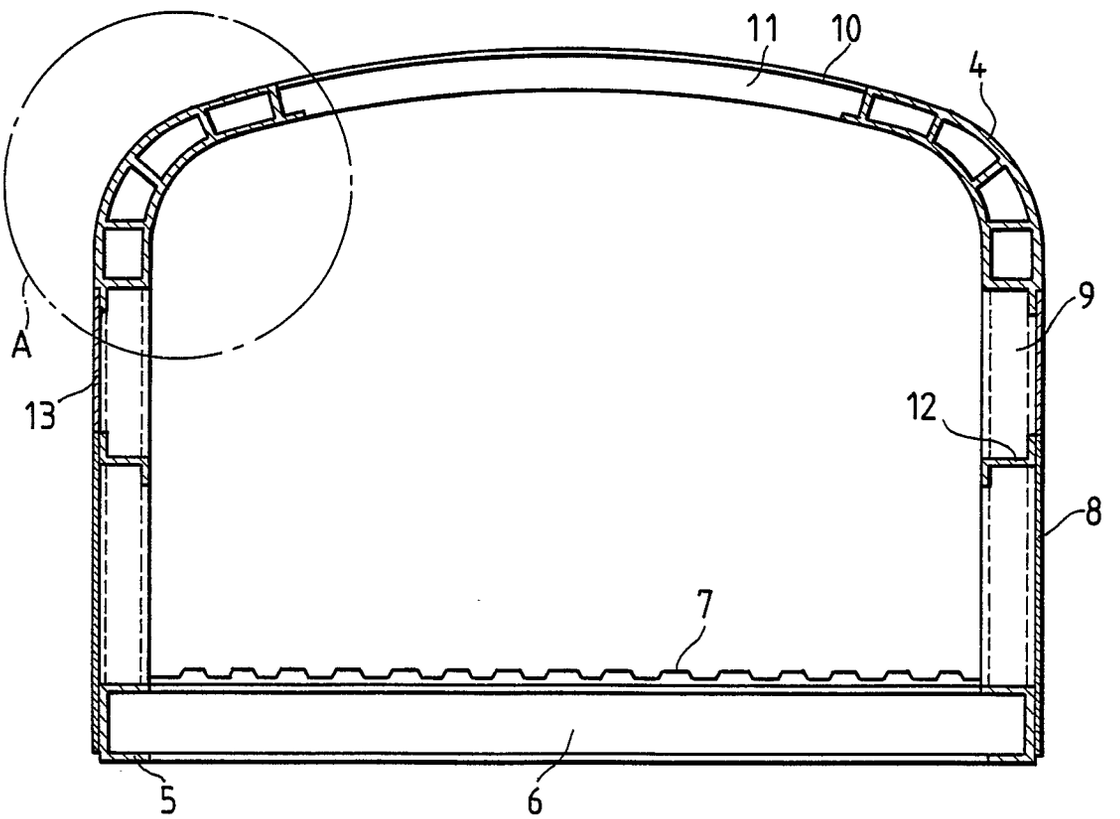


FIG. 3

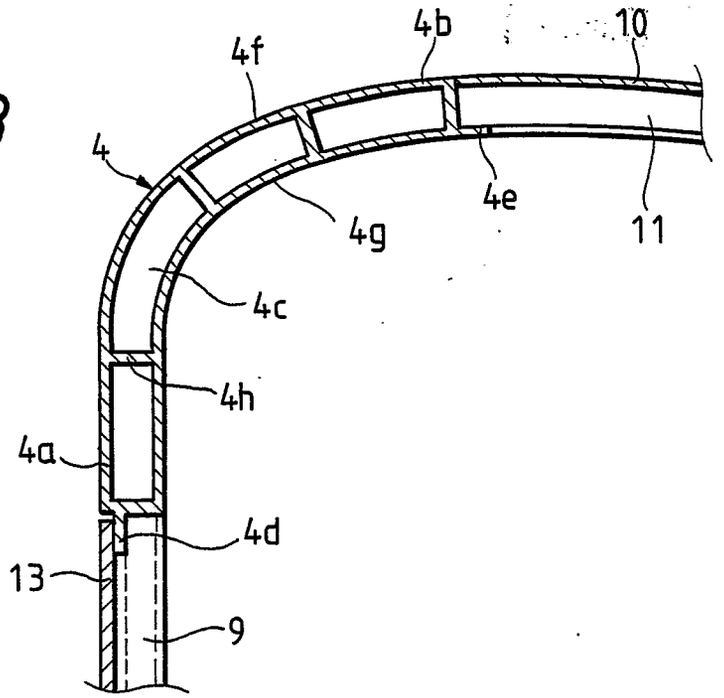


FIG. 4

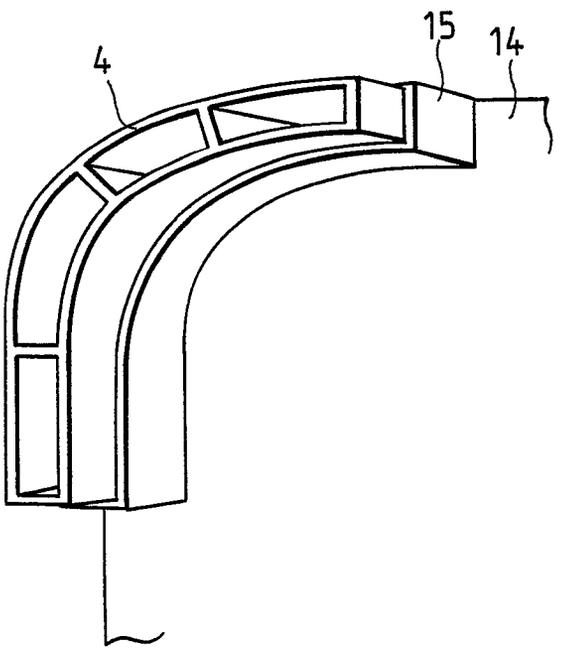


FIG. 5

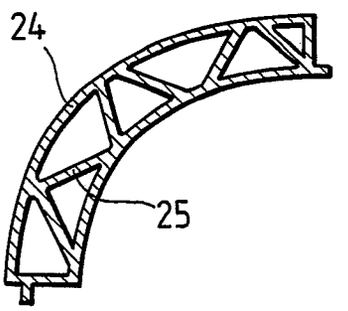


FIG. 6

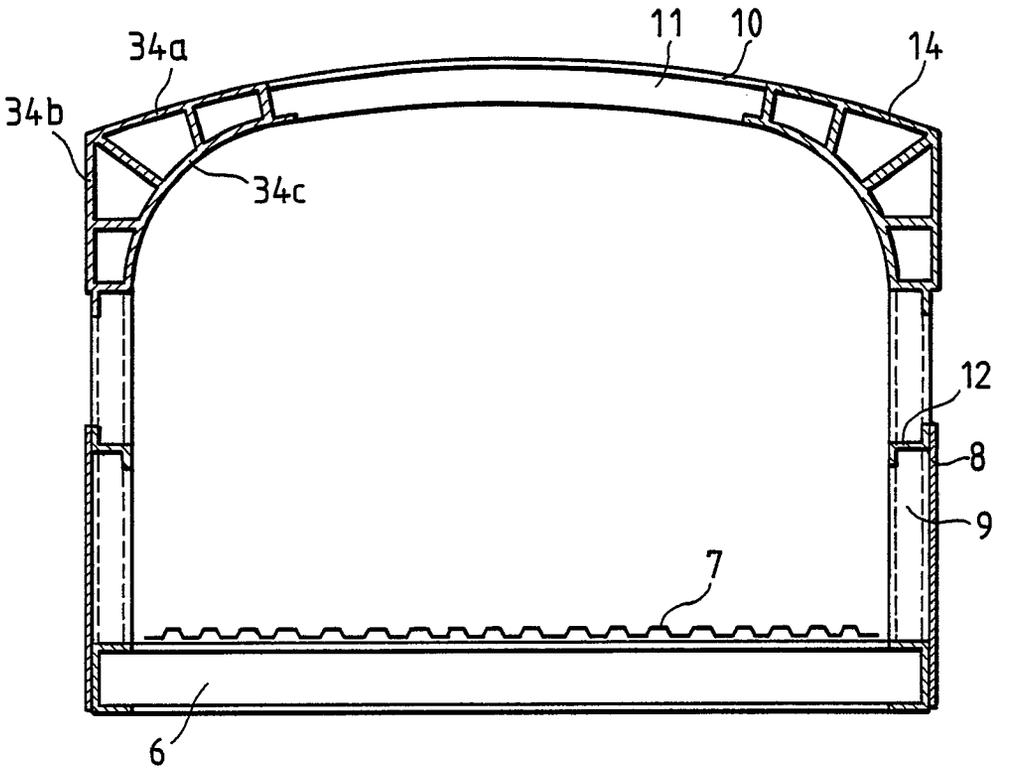


FIG. 7